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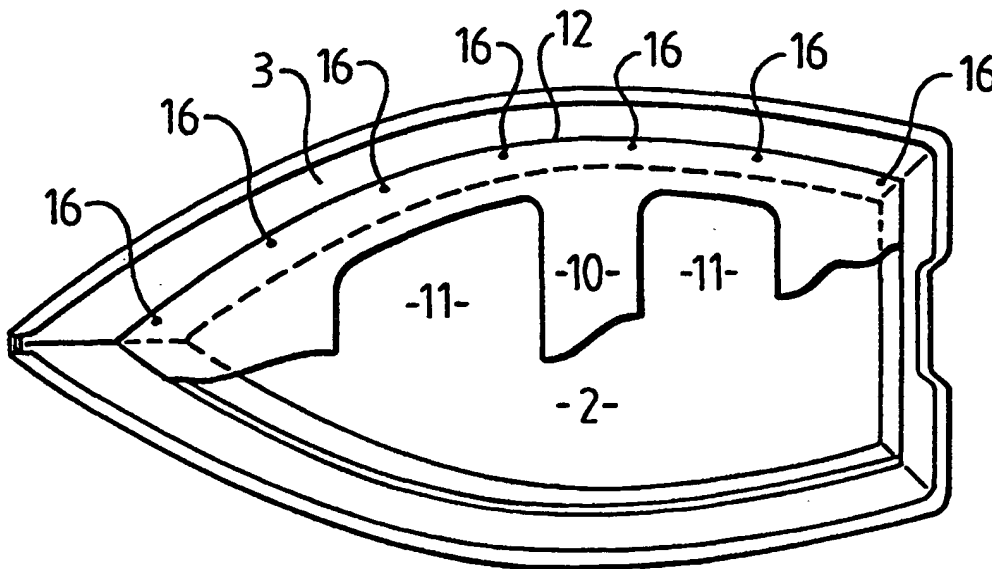
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Published*With international search report.**Before the expiration of the time limit for amending the claims and to be republished in the event of the receipt of amendments.*

(54) Title: A BOAT HULL



(57) Abstract

The invention comprises a hull having a bottom part (2) and sides (3). A plate (10) is fixed to the sides (3) at at least a substantial number of points around the periphery of the plate (10) and the plate (10) is spaced apart from the bottom part (2). In a particular embodiment the hull is flexible and by placing plates of different sizes or indeed by altering the footprint of a plate (10) the contour of the bottom part (2) can be adjusted.

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TITLE**A Boat Hull****BACKGROUND**

This invention relates to a hull and/or a method of forming a hull and/or a method of controlling the shape or configuration of a hull and has been devised particularly though not solely for use in relation to hulls which have been rotationally moulded of materials such as polyethylene and in particular single skin rotationally moulded hulls.

Polyethylene has previously been used for rotationally moulding boat hulls. To date the rotationally moulded hull is usually formed as a double skin with the inner and outer layers bonded together at some position to give rigidity. This is often achieved by providing ribs on one or both layers and bonding the layers together at the position of the ribs. This is required as polyethylene is a flexible material which is able to flex in substantially all directions from the plane of the material. Polyethylene is a desirable material from which to form a boat hull because of its high impact resistance and resistance to wear by scuffing or scraping. It has been suggested to make a hull from a single skin and to provide a tunnel or corrugations in the material to provide rigidity to the hull notwithstanding the use of the flexible polyethylene material. However this does not provide sufficient rigidity in use. Double skin polyethylene boats are disadvantageous because the double skin leads to a heavy hull for example about two and half times the weight of a single skin. Also some flexing can occur between the positions of the joins.

OBJECT

It is an object of the present invention to provide a hull and/or a method of forming a hull and/or a method of controlling the shape and configuration of a hull which will go at least some distance towards obviating or minimising the foregoing disadvantages in a simple yet effective manner or which will at least provide the public with a useful choice.

BRIEF DESCRIPTION OF THE INVENTION

Accordingly in one aspect the invention consists in a hull having a bottom part and sides, a plate fixed to the sides at at least a substantial number of points around the periphery of the plate and the plate being spaced apart from the bottom part.

Preferably the plate has cut-outs within the area of the plate.

Preferably the cut-outs do not extend to the periphery of the plate.

Preferably the plate is substantially continuous adjacent the sides about the periphery of the plate.

Preferably in a preferred form the plate is buoyant.

Preferably the hull is formed of material substantially flexible in all directions from the plane of the material, the plate when affixed to the sides giving operationally effective stiffness to the hull.

Preferably the bottom part and sides are formed by single skin rotational moulding of a plastics material.

Preferably the plate is formed by rotational moulding of a plastics material.

Preferably the plastics material is polyethylene.

Preferably the sides have an outwardly extending rebate, the periphery of the plate being positioned in the rebate and fixed to the material defining the rebate.

In a further aspect the invention consists in a method of forming a hull comprising the steps of providing the bottom parts and sides of a hull, providing a plate and attaching the plate to the sides at least a substantial number of points, the plate being spaced from the bottom part.

5 Preferably the bottom parts and sides are formed by single skin rotational moulding of plastics material.

Preferably the plate is formed by rotational moulding of a plastics material.

10 Preferably the plastics material is polyethylene.

In a still further aspect the invention consists in a method of controlling the shape or configuration of a hull having bottom parts and sides and having a degree of flexibility, the method comprising the steps of positioning a plate within the bottom parts and sides, the plate being spaced from the bottom parts and attaching the plate to the sides, the step
15 of attaching giving the hull a degree of stiffness which is operationally effective.

Preferably the sides are drawn inwardly from or moved away from the rest position of the sides thereby altering at least the fore and aft curvature of the bottom parts of the
20 hull.

Preferably the method further includes the step of selecting a desired size of plate.

Preferably said method further includes the step of altering the effective width of the plate after attachment to the sides so as to vary the curvature of the bottom parts of the
25 hull.

To those skilled in the art to which the invention relates, many changes in construction and widely differing embodiments and applications of the invention will suggest themselves without departing from the scope of the invention as defined in the appended
30 claims. The disclosures and the description herein are purely illustrative and are not intended to be in any sense limiting.

BRIEF DESCRIPTION OF THE DRAWINGS

35 One preferred form of the invention will now be described with reference to the accompanying drawings in which:

5 Figure 1: is a side elevation of a hull according to one preferred form of the invention, and

Figure 2: is a view of the hull of Figure 1 from the stern,

10 Figure 3: is a plan view of the hull of Figure 1 with a plate forming part of the invention partly cut away.

Figure 4: is a perspective view of a possible plate construction for use in the invention,

15 Figure 5: is a cross section on "A-A" in Figure 4 but showing the hull, and

Figure 6: is a diagrammatic view through a connection between parts of a hull and a plate according to the invention.

20

DESCRIPTION OF PREFERRED EMBODIMENTS

In the preferred form of the invention a hull is provided which include a base hull unit which has a bottom 2 and sides 3. When in the preferred form the base hull unit hull 1 is formed from a flexible material that is to say, again in the preferred form, a material which is able to flex out of its plane at any point of the material. A material of this type is polyethylene. In the preferred form the bottom parts 2 may be substantially flat and by flat is meant a surface which may have some curvature but presents a flat surface in the form of a dory without any substantial keel. Skids or runners 4 may be provided if desired.

30

In the preferred form the base hull unit 1 is provided by rotational moulding of polyethylene material to form a single skin. Features of the invention however are applicable to for example a double skin hull unit or indeed hull units formed from other materials. The rotational mould may be made to produce two hull units at a time, or inverted above the other. Once completed the hull units are divided along a centre line and the sides shaped as required.

35

5 The hull further includes a plate 10 which is shown pecked in Figures 1 and 2. The plate 10 may be formed from any suitable material such as for example a sheet of marine plywood or may be rotationally moulded from a suitable material such as polyethylene for example in the form of a double skin so as to provide buoyancy chambers at desired positions about the plate. The plate 10 is substantially rigid. In the preferred form cut-

10 outs 11 are provided in the area of the plate 10 but these do not extend to the perimeter 12 of the plate. It is desired that the perimeter 12 form a substantially continuous band although small cut-outs or apertures for example for water drainage could be provided if desired.

15 The plate 10 is affixed to the sides 3 at at least a substantial number of points. The fixing may be achieved by providing an outward rebate 15 in the sides 2 and placing the plate 10 so that its periphery extends into the rebate 15. The plate can then be affixed for example by bolts at a substantial number of positions such as bolts 16 shown in Figures 1 and 3.

20 In the construction of figure 4 a plate 10 is rotationally moulded so as to have a hollow interior 21 and thereby provide buoyancy in use. Two apertures 22 and 23 are shown but the configuration can be varied as required. The outer periphery of the plate 10 is provided with an outwardly extending rib 24 which in use is positioned in the channel

25 formed by rebate 15. This may be retained in position by including in the plate 10 trapped threaded sockets 25 which are positioned by techniques well known in the rotational moulding industry. Bolts 26 pass through apertures 27 in hull 1 to engage sockets 25 to fix the plate 10 into base hull unit 1. A suitable number of such sockets are provided to give sufficient engagement to minimise movement between base hull

30 unit 1 and plate 20. About twenty such fixing points should be sufficient for a five metre hull. A combination of flexible base hull unit 1 and substantially rigid plate 10 is maintained by this construction.

35 Other methods of attachment for example heat welding, sonic welding or the use of adhesives could be used or any other method giving a satisfactory attachment.

5 It will be apparent that where buoyancy is not provided in the plate itself buoyancy can be provided for example by positioning buoyant material between the bottom 2 and parts of the plate 10. Where cut-outs 11 are provided the remaining parts of the plate 10 will form satisfactory seating in use.

10 It is a particular advantage of the invention that the shape and configuration of the hull may be changed by changing the shape of the plate 10. Thus for example if a narrower plate 10 is provided the sides of the hull can be drawn in towards the plate 10 and this would have the effect of decreasing the curvature of the fore and aft shape of the hull. By using a wider plate the sides can be forced outwardly which has the effect
15 of increasing the curvature of the hull.

Thus from a single mould by selecting from a range of plates 10 a range of different shapes and configurations can be achieved.

20 By altering the width of the plate after installation the shape, particularly the fore and aft curvature of the hull can be changed during use of the boat. This could be achieved for example by providing a domed or downwardly curved plate and providing an adjusting device between the plate and for example the bottom parts of the hull. This could be achieved for example by a piston cylinder arrangement, a threaded pipe or a
25 telescopic arrangement or in any other suitable way. Thus for example a more planar bottom to the hull can be achieved for higher speeds and a more curved arrangement for greater stability if required.

A dory type hull is particularly suitable for this hull but the concepts could be used with
30 a "V" hull although a further plate (not shown) to form a floor may be required below the plate 10.

Thus it can be seen that at least in the preferred form of the invention a hull and/or a method of forming a hull and/or a method of controlling the shape of a hull is provided
35 which has some advantages. In relation to the forming, where a single skin rotational moulded hull is provided the mould can create two base hull units in one charge of the

5 apparatus which double hull can then be slit down the middle to form the two base hull units.

Also by suitably shaping the base hull units these can be stacked one inside the other so as to minimise storage and transportation space. The plate is transported and stored
10 separately and is installed in the base hull unit immediately prior to sale or display. Because the base hull unit and plate together give substantial strength longitudinally by placing a plate on the stern a substantial outboard motor can be carried. In particular current single skin rotationally moulded boats can carry only a relatively small motor.

15 I plan to manufacture boats by this method up to a length of about 18 feet although we believe it would be possible to manufacture larger boats. Cast alloy engine brackets may be used. Also once manufactured the boat can be used as a power boat with inboard or outboard motor or sail boat.

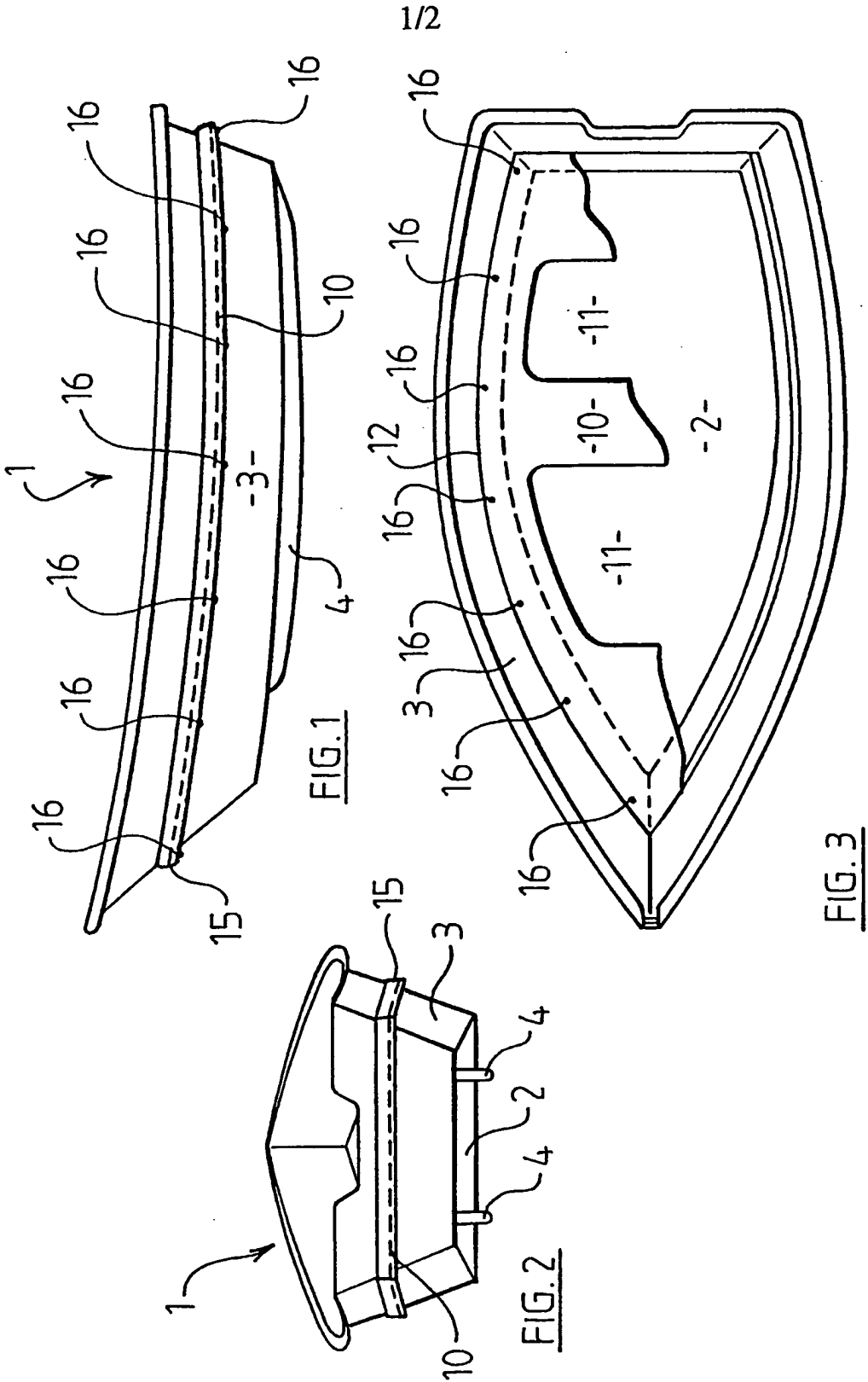
20 Although the invention is not limited to single skin rotationally moulded boats, where such manufacturing methods are used the invention makes a single skin rotationally moulded polyethylene boat technically viable as racking of the hull is reduced. In particular the weight is reduced compared to a double skin boat even if a larger wall thickness for example about 10mm is used. A double skin boat would be about two and
25 half times the weight of a single skin boat formed by the method of the present invention. The ability to vary the shape of the hull and in particular the bottom part is also an advantage. The gunwale is left with some flexibility to absorb impacts. Flotation fenders can be fixed to the gunwale.

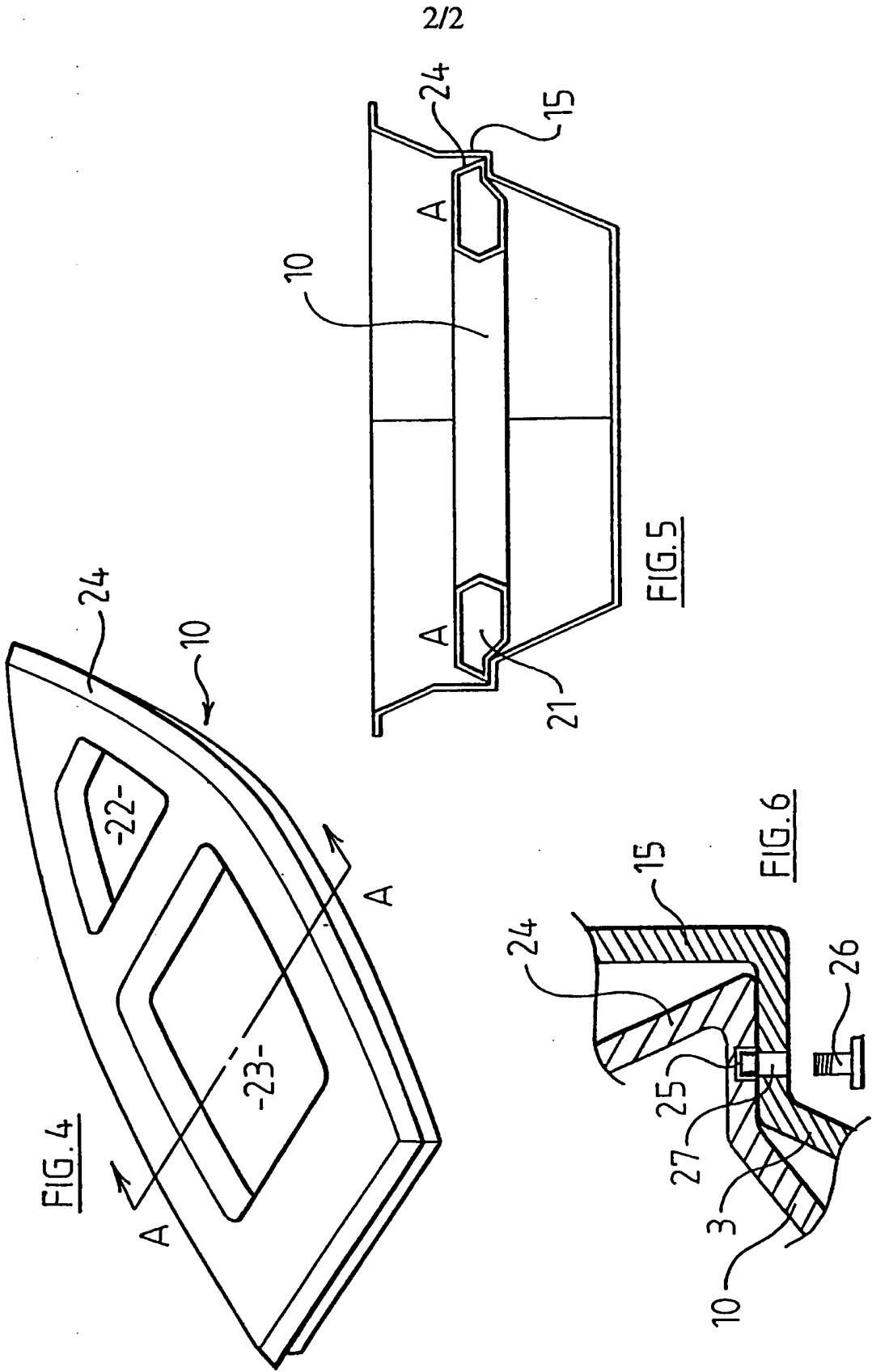
30 The invention is not restricted to any particular hull shape and can be used for a large variety of boat types including canoes.

CLAIMS:

1. A hull having a bottom part and sides, a plate fixed to the sides at at least a substantial number of points around the periphery of the plate and the plate being spaced apart from the bottom part.
2. A hull as claimed in claim 1 wherein the plate has cut-outs within the area of the plate.
3. A hull as claimed in claim 2 wherein the cut-outs do not extend to the periphery of the plate.
4. A hull as claimed in any of the preceding claims where the plate is substantially continuous adjacent the sides about the periphery of the plate.
5. A hull as claimed in any of the preceding claims where the plate is buoyant.
6. A hull as claimed in any of the preceding claims formed of material substantially flexible in all directions from the plane of the material, the plate when affixed to the sides giving operationally effective stiffness to the hull.
7. A hull as claimed in any of the preceding claims where the bottom part and sides are formed by single skin rotational moulding of a plastics material.
8. A hull as claimed in any of the preceding claims where the plate is formed by rotational moulding of a plastics material.
9. A hull as claimed in claim 7 or claim 8 wherein the plastics material is polyethylene.
10. A hull as claimed in any one of the preceding claims wherein the sides have an outwardly extending rebate, the periphery of the plate being positioned in the rebate and fixed to the material defining the rebate.
11. A method of forming a hull comprising the steps of providing the bottom parts and sides of a hull, providing a plate and attaching the plate to the sides at at least a substantial number of points, the plate being spaced from the bottom part.

12. A method as claimed in claim 10 wherein the bottom part and sides are formed by single skin rotational moulding of plastics material.
13. A method as claimed in either claim 11 or claim 12 where preferably the plate is formed by rotational moulding of a plastics material.
14. A method as claimed in either claim 11 or claim 12 wherein the plastics material is polyethylene.
15. A method of controlling the shape or configuration of a hull having a bottom part and sides and having a degree of flexibility, the method comprising the steps of positioning a plate within the bottom part and sides, the plate being spaced from the bottom parts and attaching the plate to the sides, the step of attaching giving the hull a degree of stiffness which is operationally effective.
16. A method as claimed in claim 14 wherein the sides are drawn inwardly from or moved away from the rest position of the side thereby altering at least the fore and aft curvature of the bottom parts of the hull.
17. A method as claimed in claim 14 or claim 15 wherein the method further includes the step of selecting a desired size of plate.
18. A method as claimed in any one of the claims 14 to 17 wherein said method further includes the step of altering the effective width of the plate after attachment to the sides so as to vary the curvature of the bottom parts of the hull.





INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ97/00122

A. CLASSIFICATION OF SUBJECT MATTER

IPC(6) :B63B 3/02, 5/24

US CL :114/354, 357

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 114/354, 357

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	GB 1,003,032 A (DUNLOP RUBBER COMPANY LIMITED) 02 September 1965, see fig. 2.	1-4, 11, 15
X	US 2,693,604 A (JEFFERSON) 09 November 1954, see board 24.	1-4, 11, 15
X	US 3,984,887 A (TANEMOTO) 12 October 1976, beam 24 is the plate.	15
A	US 5,063,870 (WAGNER) 12 November 1991, note panel 52.	



Further documents are listed in the continuation of Box C.



See patent family annex.

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Date of the actual completion of the international search

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/NZ97/00122

Box I Observations where certain claims were found unsearchable (Continuation of item 1 of first sheet)

This international report has not been established in respect of certain claims under Article 17(2)(a) for the following reasons:

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because they relate to subject matter not required to be searched by this Authority, namely:
2. ☐ Claims Nos.:
because they relate to parts of the international application that do not comply with the prescribed requirements to such an extent that no meaningful international search can be carried out, specifically:
3. ☒ Claims Nos.: 5-10, 12-14 and 16-18
because they are dependent claims and are not drafted in accordance with the second and third sentences of Rule 6.4(a).

Box II Observations where unity of invention is lacking (Continuation of item 2 of first sheet)

This International Searching Authority found multiple inventions in this international application, as follows:

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2. ☐ As all searchable claims could be searched without effort justifying an additional fee, this Authority did not invite payment of any additional fee.
3. ☐ As only some of the required additional search fees were timely paid by the applicant, this international search report covers only those claims for which fees were paid, specifically claims Nos.:
4. ☐ No required additional search fees were timely paid by the applicant. Consequently, this international search report is restricted to the invention first mentioned in the claims; it is covered by claims Nos.:

Remark on Protest

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The additional search fees were accompanied by the applicant's protest.

No protest accompanied the payment of additional search fees.

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